

Preface

In 2013, the second named author had the honor of succeeding Ashley Ahlin and Harold Reiter as the editor of the Problem Department of the *ΠME Journal*. This event essentially coincided with the 100th anniversary of Pi Mu Epsilon, so Miller thought it would be fun and appropriate to recognize this milestone in some way. Many others agreed. For example, Mike Pinter, from Belmont University in Nashville, Tennessee, proposed the base-16 celebratory equation

$$\begin{array}{r} \text{PMEMATH} \\ + \text{SOCIETY} \\ \hline \text{HUNDRED} \end{array}$$

(which was used in the Spring 2014 issue). Many readers submitted correct solutions, the first being Jessica Lehr of Elizabethtown College. We leave the task of determining all possible solutions as a fun exercise for you.

Being still somewhat young, energetic, and new to the job, while also gravely worried about finding enough good problems for issue after issue (not yet aware of the excellent submissions that would consistently arrive), Miller decided to celebrate with one hundred problems related to important mathematical milestones of the past century. Since one hundred is a large number of problems relative to the normal operation of the Problem Department (there are typically five or six problems per issue), he asked many colleagues for contributions. This resulted in four centennial articles, which appeared in *The Pi Mu Epsilon Journal* in 2013–2014 (**13** (2013), no. 9, 513–534; **13** (2014), no. 10, 577–608; **14** (2014), no. 1, 65–99; and **14** (2014), no. 2, 100–134).

The four articles were well received and there was strong interest in converting them into a book. The first named author came on board early in the process as a collaborator. Every entry was either expanded jointly by us from the four centennial articles or simply written anew. The second option was an essential step in converting the collection from a series of disjointed problems into a unified whole. We have used the original descriptions as springboards to introduce a variety of mathematical ideas, techniques, and applications. Whenever possible, we have quoted primary sources. Concepts are often introduced early on and then threaded through and expanded upon in later entries. The final result is a tour through much of mathematics, with an emphasis on beauty, big ideas, and interesting problems.

There are several influential collections of problems that have motivated and guided mathematics. Hilbert's problems and the Clay Millennium Problems are notable examples. We have a different emphasis here. Pi Mu Epsilon is an undergraduate mathematics honor society and thus, in addition to being important, the problems must be accessible to students. Although some of them do require analysis or algebra, number theory or probability, as a whole we hope they will be

appealing to energetic and enthusiastic math majors of all stripes. We wanted to create a collection that would motivate people who are still trying to decide what to do with their lives, as well as those who already have.

No list can be complete and there are far too many items to celebrate. This book necessarily misses many old favorites. It is largely a reflection of the personal tastes and inclinations of the two authors. Accessibility counted far more than importance in breaking the many ties, and thus the collection below is well represented with problems that are somewhat recreational but also serve as springboards to great mathematics.

We thank all the people who have helped us over the last several years. This includes the problem proposers, James M. Andrews and Avery T. Carr, who helped edit some of the original collection of problems; Miles C. Fippinger, who helped with some of the initial organization; and Ben Logsdon, who carefully read an early draft. We owe particular gratitude to Zachary Glassman, who made numerous `Tikz` drawings for some of the earlier entries. We learned many `Tikz` tricks and techniques from him, without which many of the remaining illustrations would not have been possible. In addition, we are greatly indebted to Yo Akiyama, Katherine Blake, Paula Burkhardt-Guim, Max Chao-Haft, Amina Diop, Alexandre Gueganic, Mark Hay, Bjørn Kjos-Hanssen, Forest Kobayashi, Scott Duke Kominers, Jeffrey Lagarias, David Lee, Clayton Mizgerd, José Muñoz-López, Giebien Na, Carl Pomerance, Harald Schilly, Zachary Siegel, Lily Shao, William A. Stein, Hong Suh, Alexander Summers, James Tener, Gabe Udell, and Hunter Wieman for spotting numerous mistakes, typos, and errors throughout the book or suggesting various improvements to the text. The first named author also thanks Kathy Sheldon for her considerable logistical support.

We were fortunate to work with a terrific staff at AMS (Marcia Almeida, Brian Bartling, John Brady, Sergei Gelfand, Eriko Hironaka, Arlene O'Sean, and Courtney Rose), whose tireless efforts from the start of this project years ago to the careful reading of the final draft greatly enhanced the book before you.

Although we are no longer young or energetic, it has been a fun and enlightening experience working on so many diverse topics and with so many distinguished people. Read on, enjoy, and for those of you who someday aspire to be the Problem Editor for PME, here is some useful advice: start assembling the next hundred problems today!

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